The Newsletter of the Australian and New Zealand Society of Paediatric Dentistry

# Synopses

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# The application of modern bonding systems and its implications for restoring the primary dentition

## Winner of the ANZSPD Undergraduate Essay Prize 2009

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(The University of Adelaide)

*"Provide an update and discuss the application of modern bonding systems in restorative dentistry with particular reference to the implications in the restoration of primary teeth"*

## Introduction

Developments in adhesive dentistry since the 1950s have revolutionised conservative dentistry. Previous philosophies of cavity preparation emphasised the need to provide mechanical retention, often at the expense of removing further sound tooth structure, in order to effectively retain non-adhesive restorative materials. These fundamentals have now changed with adhesion to tooth structure enabling more conservative cavity preparation.

The advent of aesthetic materials has lead more patients to demand these options where feasible and the practice of paediatric dentistry is not immune to this revolution. In fact, a survey of clinicians regarding the choice of restorative materials for children found that tooth-coloured materials were the most popular choices for restorations of the primary dentition[1].

The authors of this study speculate that this is likely to be largely driven by community concerns over amalgam[1]. However, the authors also speculate the influence of recommendations by the National Health and Medical Research Council in 1999 suggesting that amalgam should not be placed in, or removed from, the dentitions of children[2]. These recommendations conflict with more recent advice from the US Food and Drug Administration and exist despite the apparent lack of scientific evidence linking amalgam to systemic diseases or chronic illness[3,4].

As a result of the current climate and likely future directions of conservative dentistry, it would appear appropriate to review the recent developments in adhesive dental materials and the relevant bonding systems available. This paper does not aim, by any means, to provide an extensive review on aesthetic dental materials and the appropriateness of their usage, but to provide a synopsis of the more commonly used adhesive systems in conservative dentistry, particularly resin-based dentine-bonding systems and glass ionomer cements, and their relevance to restoring the primary dentition.

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## THIS ISSUE

# President's Report

Nina Vasan

## Here comes the last President's Report from the Mainland!

I trust you all had an enjoyable break over Christmas, and got to spend some well deserved quality time with family. One of the great aspects of the holiday season is the ability to reflect on the year which has gone by and an opportunity to set goals for the next year. One of my personal goals was simply to make more time for catching up with friends and family. However, with work and managing the busy social lives of young kids (now 3.5 and 8 years old – they seem to have endless play dates and birthday parties to attend!), time is often limited as another year rolls by without seeing some of those good friends. I am also aiming to attend more school events that my children are involved in. A patient's mum recently told me that her teenagers don't remember many of the material gifts given to them as children, but can recall with accuracy all the field trips she went on with them. I guess that's true, I can remember the Rocky Shore field trip when I was 7, which my mother came to, dressed most inappropriately in a silk sari!

I have had a fantastic time as President giving me the opportunity to meet many Members in different states and countries. I really enjoyed the ADA Congress in Perth, the Sedation meeting in Sydney, the symposium on 'Manky molars' in Melbourne and the inaugural ANZSPD meeting in Wellington. A personal highlight was attending an informal dinner held for Prof Louise Brearley to acknowledge the years of contribution she has made to Paediatric Dentistry. I am extremely grateful for everything she taught me as a Post Grad which has helped me personally and during my career. Thank you to the respective organising committees and Branches for making my visit memorable topped with some very nice Australian Pinot Noir. I was also involved in producing an educational dental health DVD initiated by Colgate aimed at healthcare professionals and Plunket Society in NZ.

Thank you to Colgate for the continued support provided to ANZSPD in the multiple activities sponsored, and for being the principal sponsors again for the Biennial conference in Queenstown this year. I realise that in economically challenged environments sponsorship is harder to gain and appreciate Colgate's commitment to help improve dental health worldwide.

I would really like to thank the Federal Councillors for their support and advice provided when needed. With the availability of emails and instant messaging it has been very efficient to discuss a range of ANZSPD issues between Councillors located miles apart. A special thanks to that handsome man, who is now a grandfather and has become even younger at heart – Dr Alistair Devlin. It was a pleasure to have your help. It is reassuring to know that the Society is financially secure and still remains in good standing.

Finally, I pay tribute once again at the end of this term to one of our principal founders, Dr Roger Hall for his prescience and determination to initiate ANZSPD. I feel privileged to have had the opportunity to serve the Society he helped establish.

On that note I will 'hand you over' to Dr Kareen Mekertichian as the next President. Kareen is a Specialist Paediatric Dentist in Sydney who has always been extremely supportive of ANZSPD and given much time to the Society in different roles at a State and Federal level. He is also involved in promoting paediatric dentistry throughout Australasia and continually delivering high quality presentations. Personally, Kareen has always been a mentor to me, having started his practice a few years before I did. He has always been happy to share information whether it's regarding practice management, clinical tips or the best place to holiday! I wish him all the best for his new role as President.

All the very best to everyone for 2010 and see you soon in Queenstown!

Nina

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## Composite resins

Composite resin materials are broadly defined as three-dimensional combinations of at least two different materials with a distinct interface[5]. Contemporary materials of this nature in dentistry are primarily composed of four major components: an organic phase in the form of a resin matrix containing a dispersed phase of inorganic filler particles with the interface between the two facilitated by a coupling agent. The fourth component largely consists of minor additives such as polymerisation initiators, activators, colouring pigments and stabilisers. So called 'compomers' and 'giomers', along with resin-modified glass ionomer cements, represent the spectrum of hybrid materials attempting to combine the properties of composite resins and glass ionomer cements[6].

### Bonding to enamel: Micromechanical bonding

The bonding mechanism of composite resins, compomers and giomers to tooth structure is primarily micromechanical. This concept, which established the foundation of 'adhesive' dentistry more than half a century ago, was demonstrated through the work of Buonocore and his ability to show that the treatment of enamel with phosphoric acid resulted in a porous surface and that, with the use of resin infiltration, this could produce a strong bond[7]. Clinical application of this concept, however, was not possible until the work of Bowen in the 1960s[8].

Little has changed recently with regards to the technique for establishing this bond. Recommendations suggest that the enamel should be etched with 37% phosphoric acid for 15 seconds then washed off thoroughly to develop microporosities[6]. The application of a low viscosity resin then penetrates into these microporosities and establishes resin-tags. Studies and clinical experience have shown this method of resin bonding to be reliable and strong[6,9,10].

### Dentine bonding systems: The hybrid layer

The published work of Nakabayashi in 1982 was fundamental to the clinical application of dentine bonding by demonstrating the ability to develop an interface between the resin and dentine substrates which he termed the 'hybrid layer'. Modifying the dentine surface, with an acidic agent, was shown to enable a micromechanical bond to be established by the interlocking of resin around dentinal collagen fibres[11].

Bonding of this nature, however, is complicated by the composition and structure of dentine. In particular, the main obstacle was that the basic etching, washing and drying process caused the collagen fibres to collapse and impede the successful diffusion of resin to the base of the region of demineralisation[12]. Thus, contemporary dentine bonding systems use the 'wet bonding technique', suggested by Kanca, in which residual water is used to support the demineralised dentine collagen fibres and enable the priming solution to diffuse throughout the collagen fibre network more successfully[13]. In clinical practice, however, it can be very difficult to maintain this correct balance of residual moisture[14].

### Advances in dentine bonding systems

The 'three-step' or 'conventional' system represents the oldest of the dentine bonding systems in which the etching, priming and adhesion are maintained in distinct steps. Essentially, the dentine surface is initially etched with 37% phosphoric acid which is washed off after 15 seconds in order to demineralise the dentinal surface. After washing thoroughly, the surface is dried, but not desiccated, in order to retain some moisture to support the dentinal collagen fibres exposed by the initial surface treatment. At this stage the hydrophilic priming agent is applied to displace the water enabling an unfilled resin to be applied and establish the hybrid layer. Although these products have been criticised as being technique sensitive with regards to maintaining the correct balance of residual moisture to support the collagen fibres, they are still widely used and have been shown to provide a reliable bond[6,14].

The difficulties with this system, and the desire of dental practitioners to have a simpler process, have been a significant driving force in the development of dentine bonding agents over the last 15 years. Most of these newer products have aimed at reducing the number of steps involved in the dentine bonding process[6].

The first of these developments are the so called 'two-step' systems which are divided into two further subgroups; the first of which includes a separate etch and combined priming-bonding step. Although one step is reduced in this system, the problems with the conventional system still persist[14].

The second subgroup combines the etching and priming processes with a separate adhesion step. The significant advantage of this process is the elimination of the need to wash the dentine after applying the self-etching primer as the acidic resin etches and infiltrates the dentine simultaneously thereby reducing the technique sensitivity present in most other systems[14]. Previous concerns about the ability of the etch to sufficiently prepare the enamel to maintain the marginal seal appear to have been overcome in more recent products[15].

The final and most recently developed system, described as a 'one-bottle' or 'all-in-one' system, combines all of the steps into one process. The main criticism of this system has been the reported ineffectiveness of the etching process and its likely compromise to the marginal seal and bond established. Furthermore, since these products are relatively new, no long-term clinical data is available to support their effectiveness[14, 16].

## Glass ionomer cements

Glass ionomer cements (GICs) are water-based cements which set by an acid-base reaction involving a polyalkenoic acid and an ion-leachable fluoroaluminosilicate glass, which acts as a base[17]. With the original concept of chemical bonding developed by Smith in the 1960s, more recent modifications have been aimed at enhancing the physical properties of this material and reducing its sensitivity to water balance with the addition of a water-soluble resin to produce the so-called 'resin-modified glass ionomer cements'[14].

The range of glass ionomer cements have been classified by their clinical usage: type I GICs are luting cements; type II GICs are restorative cements, with subtype 1 pertaining to aesthetic cements and subtype 2 referring to reinforced cements and type III cements are lining/base cements. Most of these products are available as either conventional or resin-modified materials[18].

### Chemical bonding

Fundamental to glass ionomer materials is the acid-base setting reaction responsible for the establishment of a chemical bond. The mixing of the cement results in the acid component degrading the surface of the glass particles releasing metal ions, fluoride ions and silicic acid. A reaction between the metal ions and carboxyl groups forms a polyacid salt to become the cement matrix with the surface of the glass becoming a silica hydrogel and unreacted glass particles comprising the filler[18].

Freshly-mixed GICs placed on dental hard tissues cause the dissolution of any smear layer and minimal demineralisation which results in the release of phosphate and calcium ions from the hydroxyapatite buffering action. These ions are absorbed into the cement resulting in the formation of an intermediate 'ion exchange layer' between the 'pure' GIC and hydroxyapatite interface composed of ions released from the tooth surface and restorative matrix[18,19]. Ionic bonding between the carboxyl ions from the cement acid and calcium ions from the tooth has been confirmed using x-ray photon spectrometry[20]. Ionic bonding to collagen in the dentine has also been proposed[21].

Resin-modified GICs undergo a similar acid-base reaction with an additional resin polymerisation phase which may be self-cure, light-cure or both depending on the product[18]. Although it is thought that resin-modified GICs largely bond to tooth structure in the same manner as conventional GICs, certain researchers have suggested the presence of a hybrid layer with micromechanical bonding, such as that seen with resin composites, although evidence in literature is currently conflicting[22-25].

### Clinical effectiveness of adhesion systems

With the advent of newer adhesion systems, the literature has attempted to address the concerns that exist with regards to simplification of dentine bonding agents and analyse differences that exist in restoration retention and marginal microleakage. Systematic reviews of clinical trials suggest that there is a tendency towards adhesives with simplified application procedures resulting in a relative loss of effectiveness of the bond[26-28]. The overwhelming majority of studies reviewed suggest that the most simplified one-step adhesive systems are the least durable with trials suggesting 3 year retention rates ranging between 50-89%. Two-step adhesives demonstrated better clinical effectiveness but had large variations in annual retention rates (0-19.3%) possibly explained by the variety of products available in this category. Although these performed less favourably than conventional three-step adhesives, this difference was not found to be significant. Three-step adhesives were shown to have retention rates of 96-100% at 5 years[26].

In comparison to dentine-bonding systems, the chemical bond developed by all glass ionomer cements exhibited the best clinical performance. Almost all GIC materials tested show favourable retention rates of 84-100% at 5 years with average annual failure rates significantly lower than all dentine-adhesive systems. These materials do, however, commonly have lower scores in bond strength tests[26]. This is largely attributed to the low cohesive strength of the material itself with internal failure of the GIC more likely to occur than debonding from the tooth surface[29].

## Implications for restoring the primary dentition

Advances in adhesive bonding systems have resulted in the availability of greater material choice for practitioners restoring the primary dentition. Although the ability to either micromechanically or chemically bond a restorative material to tooth structure enables clinicians to be more conservative in their cavity preparation and hence preserve sound tooth structure, it must be recognised that consideration of the physical properties of materials and the appropriate application of these in clinical situations remains fundamental to this process of material selection[30].

In particular, when considering material choice for restoring the primary dentition the age of the patient, caries risk and the extent of the defect or pathology requiring restoration must be taken into account. These factors include addressing how well an individual child is likely to cope with the technical requirements of placing a certain restorative material, the length of time the primary tooth is likely to remain prior to exfoliation and thus the durability of the material required to be placed taking into account differences in physical properties[28,31].

### Dentine bonding agents and composite resin restorations

The use of dentine bonding agents to establish a micromechanical bond when using composite resin materials has expanded the ability of practitioners to provide aesthetic restorations for the anterior primary dentition. Composite resin materials can be used as a means by which to aesthetically restore anterior carious lesions as well as the provision of composite resin strip crowns in more extensive cases[31,32].

In addition, the favourable physical properties of the composite resin materials are enabling more wide-spread use in restoring the posterior dentition, particularly with the aid of adhesive systems in facilitating more conservative preparation of the tooth. In particular, the preventive resin restoration, used in the management of occlusal caries, offers a conservative approach to managing existing decay while protecting the remainder of the pit and fissure system of both the primary and permanent dentitions[33, 34].

Furthermore, more recent clinical trials advocate more wide-spread use of the material in larger preparations in the posterior dentition with concerns regarding amalgam driving demand for viable alternatives[30,35]. Reviews of the

success of composite resin materials in the posterior dentition demonstrate that most contemporary resin materials are at least as successful as the use of amalgam in such situations[36,37].

### Chemical bonding and glass ionomer cement restorations

The impact of the chemical bond established between glass ionomer cements and the tooth has been disadvantaged for some time by the reported shortcomings of the physical properties of glass ionomer cements[38]. However, with the improvement of materials and the addition of the resin component to produce resin-modified GICs, more recent studies are beginning to demonstrate the possible applications of these materials. With reduced technique sensitivity, GICs and resin-modified GICs now offer a suitable alternative for the restoration of the primary dentition[39-41]. Although the physical properties of these materials should still be questioned, it is likely that the decreased rate and early detection of caries may expand the possible uses of this material in situations that allow more conservative cavity preparations[42, 43].

Even despite the concerns regarding the physical properties of GICs, more recent trials are tending to demonstrate that the physical properties of resin-modified GICs in many clinical situations are comparable to those of amalgam and composite resin[37,39]. Alternatively, the use of the so called 'sandwich technique', in which GIC materials can be laminated by a layer of composite resin or amalgam, offers a viable option in greater load-bearing situations[18].

### Further implications of the chemical bond of glass ionomer cements

In addition to the use of type II GICs as restorative materials, the ability to establish a chemical bond has further applications in restoring the primary dentition. In situations where the use of amalgam is still considered an option, type III GIC materials offer new option as a lining or base material over the dentine prior to the placement of amalgam[18]. In addition, the use of bonded amalgams is gaining popularity with studies suggesting the use of a GICs can reduce the need for extensive mechanical retention, support the remaining tooth structure through the established chemical bond, resulting in an increased resistance to flexure and cuspal fracture, decrease post-operative sensitivity and marginal leakage and reduce secondary caries around restorations[44,45]. Most studies, however, have focussed on their use in the permanent dentition and further research is required to elucidate possible implications for the use of this technique on primary teeth.

Stainless steel crowns offer the most durable restorative option for the primary dentition and are desirable in situations such as subsequent to the completion of pulpotomy procedures. Recent updates in the literature have suggested the use of type I GICs as luting cements for stainless steel crowns demonstrating greater retentive strengths than polycarboxylate cements and negligible differences between GICs and zinc phosphate cements[46]. Despite the retention of these preformed crowns remaining primarily macromechanical, the use of GICs is believed to establish a seal of the tooth structure as a result of the chemical bond[47].

### Fissure sealants

Certainly the ability of adhesive materials to bond to tooth structure has had significant implications for minimal intervention dentistry. In particular it has provided clinicians with a conservative alternative to previous 'extension for prevention' odontoplastic procedures of the fissure systems with the aim of preventing occlusal caries. Resin fissure sealants, particularly in the early permanent dentition in individuals at high caries risk, offer a conservative technique of caries prevention with minimal or no preparation required prior to the bonding procedure[48,49]. The micromechanical bond to enamel has been shown in clinical trials to be retentive for extensive periods[50].

Likewise, the chemical bond of glass ionomer cements offers an alternative for fissure protection where clinical conditions are not ideal for the placement of resin materials. Particularly in cases where moisture control is difficult, GICs are more forgiving with the additional benefit of fluoride release. Such is often the case in young patients at the mixed dentition phase where partially-erupted permanent molars require early protection, even if only temporary, due to the presence of extensive decay in the primary dentition of high risk patients[48-51].

## Conclusions

It is apparent from this review the important role adhesive systems will play in the future of restorative dentistry. The benefits offered by establishing a bond to tooth structure are redefining cavity preparation principles and are a driving force behind minimal intervention and conservative procedures. These changes have several significant implications for the practice of paediatric dentistry and the restoration of primary teeth.

With the greater availability of materials to provide aesthetic restorative options, it must not be forgotten that sound clinical judgement of material selection is still fundamental to the clinical success and effectiveness of a restorations in any dentition. The presence of and proven reliability of a micromechanical or chemical bond cannot compensate for deficiencies in the physical properties of materials.

Having stated this, clinicians should be cautious of modifications to conventional dentine-bonding systems as the literature has demonstrated that greater simplification of these procedures tends to result in greater uncertainty of the established bond. Conventional 'three-step' bonding agents and glass-ionomer cements, however, have been shown to have a reliable adhesion to tooth structure. The implications of being able to produce this adhesion in the primary dentition have been discussed briefly and are likely to expand further in the near future with new developments in material science. Nevertheless, practitioners should recognise that the physical properties of aesthetic materials remain a pivotal factor in successfully restoring the primary dentition.

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***The Organising Committee, Drs Eduardo Alcaino and Peter Wong,***
are proud to host General Anesthesia in Paediatric Dentistry Seminar to be held at the Amora Jamison, Sydney on 8 October 2010.

This one day seminar will expose delegates to international and national experts who will focus on evidence based dentistry and teach current techniques for general anesthesia in paediatric dentistry.

## Speakers & Themes

Our main speaker has been confirmed as Professor Nigel King from Hong Kong. A variety of international and national speakers will be part of the program sharing their expertise on the latest information available world wide

Clinical and didactic areas to be covered will include:

- Patient assessment and selection for GA
- Informed Consent and treatment options
- Hospital setup, protocol and booking procedures
- Common anaesthetic techniques for paediatric dental patients
- Case reports & Adverse reactions
- Mortality and Morbidity of GA in Paediatric Dentistry

## Who Should Attend?

The Seminar is expected to attract over 150 attendees primarily from Australia. Delegates will be drawn from both private and public dental practices. It is expected that attendees will comprise both general who treat children as part of their dental practice as well as specialist paediatric dentists. The meeting will be of particular interest to those who work in rural areas.

For more information on speakers and the program or to register your interest please visit the conference website on www.sydneypaediatricdenistry.com.au/2010seminar or contact the Seminar Secretariat:

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# Oral health of schoolchildren in rural Vietnam, Part III

## High intake of dietary sugars and high caries experience

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## Running Title

**Oral health of schoolchildren in rural Vietnam**

## Abstract

***Background:*** This is the third report on oral hygiene, diet and dental caries of schoolchildren in several rural villages in Vietnam, conducted in conjunction with the Rotary Australian Vietnam Dental Health (RAVDH) Project, a humanitarian aid project which provided limited dental services, oral health promotion, and continuing education to local dentists. ***Materials and Methods:*** In 2009, 200 children aged 11-14 years in the villages of Ben Cau and Han Tiep completed a questionnaire addressing their oral hygiene habits, drinking water, and their consumption of sweet drinks and sweet foods. They were also examined clinically and their DMFT scores were determined. ***Results:*** All children brushed at least daily, using a tooth brush and toothpaste. The mean (±SD) DMFT scores were similar for girls and boys: 4.1 (2.5) vs 4.2 (2.7), and for Tan Hiep and Ben Cau: 4.1 (2.6) vs 4.0 (2.6). The trend in DMFT scores increased with increasing frequency of daily consumption of sweet drinks plus sweet foods: once/day: 3.3 (1.9); 3-4 times/day: 3.8 (2.7); 5-10 times/day: 5.3 (2.6). A 12-month recall conducted on 114 glass-ionomer cement restorations placed in a further 33 children by the Project team in 2008 found 87% complete retention. Caries was very prevalent, affecting 94-96% of the 389 children examined during the three Project visits in 2007-2009. Mean DMFT scores were consistently higher when sweet drinks were consumed ≥ 3 times/day in comparison with twice/day: 2007: 4.7 (0.8) vs. 4.5 (2.8); 2008: 9.3 (2.7) vs. 4.7 (109); 2009: 5.7 (2.4) vs. 3.4 (2.4). An abundant supply of inexpensive sweet drinks and sweet foods, many aimed at consumption by children, was noted, including in school canteens. ***Conclusions:*** These studies highlight the urgency for professional dental care, preventive measures including moderation of intake of dietary sugars, and oral health education among these Vietnamese children.

## Introduction

### The Rotary Australia Vietnam Dental Health (RAVDH) Project

The humanitarian aid Rotary Australia Vietnam Dental Health (RAVDH) Project, and its association with the National Hospital of Odontostomatology in Ho Chi Minh City, Vietnam, has been reviewed previously in this series of papers.[1,2] Since 2004, the Project has provided limited dental services to children from several rural schools in the villages of Vi Thanh (Han Giang Province, 2004-2008, inclusive), Ben Cau (Tay Ninh Province, 2006-2009), and Tan Hiep (Kien Giang Province, 2009). The Project aims to improve oral health promotion and oral health of groups of children in these villages, to assess the impact of previous Project visits, and to provide continuing dental education and support to local dentists. Locally, the Project has supported the development of basic dental equipment in dental clinics and school-based tooth brushing programs.

Most recently in Tan Hiep, the Project has added to the District Hospital dental clinic by furnishing the following: a fully functioning dental chair and operating light, dental air compressor, table top autoclave steriliser, curing light, high energy mixer, a wide array of hand instruments, and a storage cabinet. The Project has fully funded a five-year tooth brushing program for primary schoolchildren, providing tooth brushes and fluoride toothpaste, sufficient for all pupils twice weekly. Water faucets, basins and initial tooth brushes were provided by the school. The Project currently supports a school-based dental hygienist with minor equipment, materials and education resources.

### Oral health of rural schoolchildren studied in RAVDH Projects in 2007 and 2008

In association with Project visits in 2007 and 2008, two studies on the oral health of rural schoolchildren were conducted and have been reported in this series of papers.[1,2] In 2007, oral hygiene practices and dietary habits of 142, 12-16 year-old children in four schools in Ben Cau were examined.[1] Most children (77%) cleaned their

teeth twice or more per day, including before breakfast and before bed (51%), using a tooth brush, toothpaste, toothpicks and rinses (47%). Daily, the mean number of exposures to sweet drinks plus sweet foods was 2.6 (1.6); the caries experience trend increased significantly ($p<0.01$) with increasing frequency of sweet drink consumption. Very prevalent, caries affected 96% of 69, 12 year-olds examined; the mean DMFT (±SD) was 4.4 (2.3).[1]

In 2008, 193 children aged 12-15 years were studied in three schools in Ben Cau and Vi Thanh.[2] As seen in 2007, frequent daily sweet drink consumption was associated significantly ($p<0.001$) with caries experience. High between-meal intakes of sweet drinks were reported by 74% of children, and of sweet foods by 92%. Caries affected 94% of 120, 12-13 year-olds examined clinically; the mean DMFT was 3.8 (2.4). Despite using age-appropriate fluoride toothpastes, fluoride exposure was suboptimal; none of the drinking water sources measured contained sufficient fluoride.[2]

### Oral health of rural schoolchildren studied in the RAVDH Project in 2009

In conjunction with the RAVDH Project conducted in March 2009 in two rural villages in Southern Vietnam, the present study investigated oral hygiene practices, dietary habits, and caries experience of schoolchildren. In addition, it was possible to assess some restorations placed in children in Ben Cau by Project dentists in 2008. Since 2009 was the fourth consecutive visit to Ben Cau and the first visit to Tan Hiep, evaluation of a school-based tooth brushing program implemented in both villages and perceptions of the impact of previous RAVDH Projects were of interest. The author (TV) is fluent in the Vietnamese language, facilitating the collection of pertinent observations.

## Materials & Methods

### The Rotary Australia Vietnam Dental Health (RAVDH) Project 2009

As part of the RADVH Project, a volunteer group of dentists, dental specialists, dental nurses, dental students and a dental therapist attended the dental clinics at the Tan Hiep District Hospital and the Ben Cau District Health Centre. The field team (two dentists, three dental nurses, one dental therapist, one dental student), was accompanied by a local Vietnamese interpreter, two local dentists from the National Hospital of Odontostomatology in Ho Chi Minh City, and personnel staff from both clinics.

Taking dental equipment and consumables from Australia, the team worked for one week in each village. The Tan Hiep clinic had two modern dental chairs with dental units, two tables and pillows for triaging, chair-mounted overhead lamps and portable operating head torches. The Ben Cau clinic had one modern dental chair and dental unit, a basic reclinable chair, a portable handpiece, and a stretcher for triaging.

Children were pre-selected for attendance by local dentists. Early in each clinical session, the children were triaged by treatment needs and relative difficulty. Treatment was then ordered by complexity, providing simple and complex restorations of permanent anterior and posterior teeth, fissure sealing permanent molars and premolars, pulp extirpations of permanent incisors, and simple extractions of symptomatic primary teeth. Conventional glass-ionomer cement (Fuji IX™, GC Asia Dental Pty Ltd, Singapore) was used for sealants and posterior restorations; some anterior teeth were restored with resin composite. Over the two weeks at both locations the teams treated 723 children, placing 1,565 restorations and 1,228 fissure sealants, and performing 111 extractions. The present study was undertaken in conjunction with the Project.

### Study Sample

Ethics approval from the Departmental Human Ethics Advisory Group (Melbourne Dental School, University of Melbourne) was obtained prior to commencing the study. Plain language statements and consent forms were given to teachers of each school group for completion if they wished; parental consent was assumed by the child's clinic attendance and child consent was obtained at the time of examination. A total of 200 children (Tan Hiep: 89; Ben Cau: 111) aged 11-14 years participated in the study. The sample size was limited by time and available resources.

### Dental examination

A DMFT score was obtained for all 200 children from a mirror and sickle probe examination by a team clinician and recorded by the author, charting caries, restorations and missing teeth. Caries was diagnosed where cavitation was visible or discolouration showed through enamel. In judging whether missing teeth were extracted or unerupted, the guidelines established previously for the study in 2007 were used.[2] Teeth were not cleaned, dried or radiographed before examination, as facilities precluded this.

### Questionnaire

The anonymous 15 item questionnaire (in Vietnamese) containing choices and open-ended questions (developed for the 2008 study) was used to collect data on participant's age, gender, oral hygiene habits, whether they had been taught to brush, drinking water sources, and their consumption of sweet drinks and sweet foods.[2] Questionnaires were administered by the author, reading the questions to each child, clarifying uncertainties, recording their answers, and taking care not to influence their responses. Children identified their typical toothpaste, mouth rinse and sweet drinks from prepared displays.

### Preparation of product displays

In Tan Hiep, local shops were visited and shopowners were asked about the most popular oral hygiene products sold to local residents. Samples of these were then purchased (three toothpastes, one mouth rinse) and assembled for display on a table in the dental clinic. The toothpastes were: P/S™ Blue Advanced Anti Cavity (Unilever Co. Ltd, Vietnam), P/S™ Red Toothpaste for Kids Strawberry (Unilever Co. Ltd, Vietnam), and Colgate™ Toothpaste with Fluoride Mint Flavour (Colgate Palmolive Co., Vietnam); the mouth rinse was Listerine™ Freshburst (Pfizer, Vietnam).

In Ben Cau, a large duty-free supermarket on the Vietnamese-Cambodian border was the main supplier of oral hygiene products to village residents. About 10-15 different toothpastes and 10 mouth rinses were stocked, providing a wider range than seen in Tan Hiep; popular products were similar in both locations. A random selection of products was purchased to expand the table display, adding toothpastes: Aquafresh™ Fluoride toothpaste Triple Protection Bubble Mint Flavour (GlaxoSmithKline, U.S.A), Closeup™ Active Gel with Crystal Frost Granules Winter Frost Flavour (Unilever Co. Ltd, Vietnam), Ultrabrite™ Anticavity Fluoride Toothpaste Baking Soda and Peroxide Whitening Toothpaste Cool Mint Flavour (Colgate Palmolive Co, Mexico); and a mouth rinse: Freshplus™ Peppermint Mouthwash (Phoenix Brands, USA).

Popular sweet drinks were purchased for a display for children to identify those they consumed most frequently. The same display was used in both locations, adding two drinks available only in Ben Cau to the Tan Hiep display. The drinks displayed were: Coca Cola™, 7Up™, Sting™, Wonderfarm™ Wintermelon Drink, C2™ Lemon Tea, Red Bull™ Energy Drink, Nature™ Lychee Drink and Sunlee™ Green Tea (with Milk).

### Assessment of restorations

In Ben Cau, restorations placed by Project clinicians in 2008 (114 restorations placed in 33 children), and by local dentists since 2007 (20 restorations placed in 11 children), were examined by the author. These children did not participate in the clinical examination and questionnaire study. Marginal discolouration, adaptation, anatomic form, and caries were scored by United States Public Health System (USPHS) criteria.[3]

### On site observation of oral hygiene program

The functioning of the ongoing oral hygiene program previously established by the RAVDH Project in 2007 was observed on site. The author interacted directly with local Vietnamese personnel and observed the place of the program in daily school activities, and the attitudes of teachers and local dental staff towards diet and oral health.

### Statistical analysis

Data were entered into Excel spreadsheets (Microsoft Corp., Seattle, Washington, USA) and distributions were studied by descriptive statistics. Categorical trends in mean DMFT scores were examined by the Chi-squared trend statistic (df=1) for non-parametric data.[4] Noting the potential for inflating Type II errors (possibility of accepting a null hypothesis when then alternative hypothesis is true) in clinical data, the critical level for alpha was set conservatively at 0.01.

## Results

### Age and gender distribution

The study sample of 200, 11-14 year-olds contained 89 children from Tan Hiep and 111 children from Ben Cau; 112 (56%) were girls and 88 (44%) were boys (Table 1).

### Dental caries experience

The distribution of DMFT scores by gender and village is shown (Table 2). Eight children (4%) were caries-free; most children (62%) had DMFT scores of 2-5, and 22% had DMFT scores of 6-9. The caries prevalence was 96%; the mean (±SD) DMFT score for all children was 4.1 (2.6). The mean DMFT scores were similar for girls and boys: 4.1 (2.5) vs. 4.2 (2.7), and for Tan Hiep and Ben Cau: 4.1 (2.6) vs. 4.0 (2.6).

### Oral hygiene habits and caries experience

All children brushed their teeth at least daily using a tooth brush and toothpaste, and most brushed their teeth twice or more per day (76%), typically before breakfast and before bed (77%; Table 3). Additional to brushing, 97% used other oral hygiene aids, particularly toothpicks (used by 71%) and mouth rinses (water, salty water, or commercial), which were used by 94% of children. Six children reported flossing. The most popular toothpastes were two P/S™ brand products (used by 76%). Few children (14%) used commercial mouth rinses; of those who did, Listerine™ was the most popular brand. Most children (76%) reported being taught to brush, typically by their parents and/or teachers (99%). The most frequently-consumed water sources were bottled (48%) and tap water (47%), which was boiled or filtered at home for 15 of 93 children who reported drinking tap water.

Some mean DMFT scores below the overall mean of 4.1 (2.6) were noted as follows: tooth brushing twice per day: 3.8 (2.6); tooth brushing both before breakfast and before bed: 3.8 (2.6); additional use of toothpicks and mouth rinses: 3.7 (2.4), tooth brushing taught by parents: 3.9 (2.6), and using bottled or tap water: 3.9 (2.5) (Table 3).

### Exposure to dietary sugars and caries experience

Most children reported consuming sweet drinks once or twice per day (86%), and sweet foods once or twice per day (73%; Table 4). The mean (±SD) daily consumption frequencies were: sweet drinks: 1.3 (0.9), sweet foods: 2.0 (1.0), and 3.0 (1.8) for sweet drinks plus sweet foods. Among children consuming these dietary sugars, between-meal consumption of sweet drinks was reported by 44% and of sweet foods by 53%. Few children reported not consuming sweet drinks (n = 13), sweet foods (5), or sweet drinks plus sweet foods (10). Amongst those consuming sweet drinks plus sweet foods once or more per day, the trend in DMFT scores increased (but without statistical significance) with increasing consumption frequency, from a mean of 3.3 (1.9) for once per day, to 3.8 (2.7) for three to four times, and to 5.3 (2.6) for five to ten times per day.

### Favourite sweet drinks and sweet foods

Children named their favourite sweet foods and identified the displayed sweet drinks they drank most frequently (Table 5). Most popular were 'fizzy' drinks (chosen by 35%), high 'energy' drinks (28%), then local drinks (Wonderfarm™ Wintermelon drink, C2™ Lemon Tea). Excluding fruit drinks and milk drinks (preferred

by few), the mean DMFT scores were highest for children favouring fizzy, high energy, and local drinks: range: 3.6 (2.8) – 4.7 (2.7). The most popular sweet foods were cakes and sweetened breads (chosen by 53%), followed by candy (34%); the mean DMFT scores were highest for children with these preferences: range: 3.5 (3.0) – 4.5 (2.7).

### Assessment of restorations

Some restorations placed by Project clinicians in 2008 were available for assessment (Table 6). Of 44 children examined, 33 had restorations (n = 114) placed by RAVDH Project clinicians and 11 had restorations (n = 20) placed by local Vietnamese dentists. At this 12 month recall, 99 restorations (87%) placed by Project clinicians were present; 6 restorations were partially missing, and 9 were completely missing. Most restorations placed by both groups were confined to occlusal surfaces; few included proximal surfaces. All restorations placed by RAVDH Project clinicians were conventional glass-ionomer cement (Fuji IX, GC Asia Dental Pty Ltd, Singapore); those placed by local dentists included glass-ionomer cement, amalgam, and resin composite.

Restorations free of marginal discolouration were distributed similarly in both groups (Project clinicians: 83%; local dentists: 80%; Table 6). Anatomic form appeared better in restorations placed by Project clinicians than local dentists: 75% vs. 60% continuous with existing anatomic form, and fewer under-contoured restorations (13% vs. 25%). Marginal adaptation appeared better in restorations placed by Project clinicians; 69% (vs. 55%) showed no visible restoration-tooth crevice. Most restorations showed no evidence of caries contiguous with restoration margins (91% vs. 90%). Most restored teeth were first permanent molars (63 vs. 17); Project clinicians also restored 24 second permanent molars, 16 canines and premolars, and 11 incisors (not tabulated).

### On-site observation of oral hygiene program

School-based tooth brushing programs were set up in 2007 at Ben Cau and

TABLE 1: DISTRIBUTION OF 200 CHILDREN AGED 11-14 YEARS (89 IN TAN HIEP AND 111 IN BEN CAU) BY AGE, GENDER AND LOCATION

| Age (years) | Girls (n=112) | | Boys (n=88) | | Total children (n=200) |
|---|---|---|---|---|---|
| | Tan Hiep (n=36) | Ben Cau (n=76) | Tan Hiep (n=53) | Ben Cau (n=35) | |
| 11 | 6 | 0 | 25 | 1 | 32 |
| 12 | 22 | 44 | 19 | 19 | 104 |
| 13 | 7 | 28 | 8 | 11 | 54 |
| 14 | 1 | 4 | 1 | 4 | 10 |
| Total (%) | 36 (18) | 76 (38) | 53 (27) | 35 (17) | 200 (100) |

TABLE 2: CARIES EXPERIENCE OF 200 CHILDREN AGED 11-14 YEARS IN TAN HIEP AND BEN CAU

| Caries experience (DMFT range)* | Girls (n=112) | | Boys (n=88) | | Total children (n=200) (%) |
|---|---|---|---|---|---|
| | Tan Hiep (n=36) | Ben Cau (n=76) | Tan Hiep (n=53) | Ben Cau (n=35) | |
| 0-1 | 4 | 10 | 4 | 6 | 24 (12) |
| 2-5 | 23 | 45 | 35 | 21 | 124 (62) |
| 6-9 | 7 | 19 | 12 | 6 | 44 (22) |
| 10-13 | 2 | 2 | 2 | 2 | 8 (4) |
| Mean DMFT (±SD) | 3.8 (2.6) | 4.3 (2.5) | 4.5 (2.6) | 3.7 (2.7) | 4.1 (2.6) |
| Mean DMFT (±SD) | 4.1 (2.5) | | 4.2 (2.7) | | 4.1 (2.6) |

*DMFT included dmft where primary teeth were present

TABLE 3: REPORTED ORAL HYGIENE PRACTICES AND MEAN DMFT SCORES OF 200 CHILDREN AGED 11-14 YEARS IN TAN HIEP AND BEN CAU

| Oral Hygiene Practices | Frequency or Pattern | Distribution of Children (n=200) (valid %) | Mean DMFT (±SD) |
|---|---|---|---|
| Frequency of tooth brushing per day | No brushing | 0 | 0 |
| | Once | 49 (24) | 4.7 (2.8) |
| | Twice | 99 (50) | 3.8 (2.6) |
| | Three or four times | 52 (26) | 4.1 (2.3) |
| Time of tooth brushing | Before breakfast + before bed | 99 (50) | 3.8 (2.6) |
| | Before breakfast only | 46 (23) | 4.7 (2.7) |
| | Before breakfast + after lunch + before bed | 35 (18) | 4.0 (2.0) |
| | Before breakfast +/- after breakfast + after lunch/ after dinner/before bed | 11 (6) | 5.2 (3.3) |
| | Before breakfast + after lunch + afternoon/before dinner + before bed | 5 (3) | 3.6 (2.7) |
| | After lunch only/ before bed only | 2 (1) | 7.5 (2.1) |
| | After breakfast + after dinner/before bed | 2 (1) | 4.5 (0.7) |
| Oral hygiene aids used | Toothbrush + toothpaste | 200 (100) | 4.1 (2.6) |
| | Toothbrush + toothpaste only | 6 (3) | 5.2 (3.2) |
| Aids used in addition to tooth brush and toothpaste | Plus toothpicks + water rinse | 67 (34) | 4.4 (2.7) |
| | Plus toothpicks + salty water rinse +/- water rinse | 38 (19) | 3.7 (2.4) |
| | Plus water rinse only | 28 (14) | 4.2 (2.5) |
| | Plus toothpicks + mouth rinse +/- salty water rinse +/- water rinse | 22 (11) | 3.7 (3.0) |
| | Plus salty water rinse + water rinse | 20 (10) | 3.8 (2.4) |
| | Plus mouth rinse +/- salty water rinse +/- water rinse | 5 (3) | 4.8 (3.0) |
| | Plus floss + toothpicks +/- mouth rinse +/- salty water rinse +/- water rinse | 6 (3) | 3.2 (1.2) |
| | Plus toothpicks or salty water rinse | 8 (4) | 5.4 (2.8) |
| Taught how to brush teeth? | Yes | 152 (76) | 4.2 (2.5) |
| | No | 48 (24) | 4.0 (2.8) |
| Taught to brush teeth by whom | Parents only | 100 (66) | 3.9 (2.6) |
| | Teachers +/- parents | 50 (33) | 4.8 (2.5) |
| | Dentists +/- parents | 2 (1) | 3.5 (0.7) |
| Source of drinking water | Bottled | 95 (48) | 3.9 (2.5) |
| | Tap (including boiled or filtered) | 93 (47) | 4.0 (2.5) |
| | Well/ rainwater | 12 (6) | 6.0 (3.3) |

TABLE 4: CONSUMPTION OF SWEET DRINKS AND SWEET FOODS AND MEAN DMFT SCORES OF 200 CHILDREN AGED 11-14 YEARS IN TAN HIEP AND BEN CAU

| Consumption of sweet drinks and sweet foods | Frequency of Daily Consumption | Distribution of Children (n=200) (valid %) | Mean DMFT (±SD) |
|---|---|---|---|
| Sweet drinks | None<br>Once<br>Twice<br>Three to five times | 13 (7)<br>141 (70)<br>32 (16)<br>14 (7) | 4.0 (1.4)<br>4.1 (2.7)<br>3.4 (2.4)<br>5.7 (2.4) |
| Mean frequency (±S.D) | 1.3 (0.9) | | |
| Sweet foods | None<br>Once<br>Twice<br>Three ≥ five times | 5 (3)<br>68 (34)<br>77 (39)<br>50 (25) | 4.6 (2.3)<br>3.8 (2.4)<br>4.2 (2.8)<br>4.5 (2.6) |
| Mean frequency (±S.D) | 2.0 (1.0) | | |
| Sweet drinks plus sweet foods | None<br>Once<br>Twice<br>Three to four times<br>Five to ten times | 10 (2)<br>19 (10)<br>51 (26)<br>88 (44)<br>32 (16) | 5.8 (3.0)<br>3.3 (1.9)<br>3.9 (2.1)<br>3.8 (2.7)<br>5.3 (2.6) |
| Mean frequency (±S.D) | 3.0 (1.8) | | |
| Time of consumption of sweet drinks | With meals<br>Between meals | 105 (56)<br>82 (44) | 4.2 (2.7)<br>4.0 (2.6) |
| Time of consumption of sweet foods | With meals<br>Between meals | 92 (47)<br>103 (53) | 4.0 (2.4)<br>4.2 (2.7) |

TABLE 5: DISTRIBUTION OF SWEET DRINKS AND SWEET FOODS CONSUMED AND MEAN DMFT SCORES OF CHILDREN AGED 11-14 YEARS IN TAN HIEP AND BEN CAU

| Consumption of sweet drinks and sweet foods | Types or brands of sweet drinks and sweet foods | Distribution of Children n (%) | Mean DMFT (±SD) |
|---|---|---|---|
| Most frequently consumed sweet drinks<br>(n = 187 children) | Fizzy drinks (Coca Cola™, 7Up™, Pepsi™, Sarsaparilla™) | 66 (35) | 4.7 (2.7) |
| | Energy drinks (Sting™, Red Bull™ Energy Drink) | 53 (28) | 3.6 (2.8) |
| | Wonderfarm™ Wintermelon drink | 32 (17) | 3.9 (2.4) |
| | C2™ Lemon Tea | 26 (14) | 4.0 (2.2) |
| | Fruit drinks (Orange Juice, Nature™ Lychee drink, Strawberry and Orange drink) | 7 (4) | 3.4 (3.6) |
| | Milk drinks (Sunlee™ Green Tea milk drink, bagged milk) | 3 (2) | 5.3 (1.5) |
| Favourite sweet foods<br>(n = 195 children) | Cakes, sweetened bread | 103 (53) | 4.5 (2.7) |
| | Sticky candy | 36 (18) | 4.1 (2.2) |
| | Hard candy | 32 (16) | 3.5 (3.0) |
| | Soft candy | 8 (4) | 4.5 (1.6) |
| | Ice cream, yoghurt | 9 (5) | 2.3 (1.2) |
| | Sweet soup | 5 (3) | 3.2 (1.5) |
| | Dried fruit | 2 (1) | 4.0 (0) |

in 2009 in Tan Hiep by the RAVDH Project. In both Tan Hiep and Ben Cau they are delivered in one school in each village. In 2009, the functioning of these programs was observed to be very well received. In Tan Hiep, a previously-established but only partially-implemented weekly fluoride rinsing program has been replaced with a daily tooth brushing program for the entire school population of about 900. Tooth brushes and fluoride toothpastes were donated; communal tooth brushing sinks and clean water sources were developed at each school in conjunction with parent groups. At Ben Cau, the tooth brushing program was carried out twice weekly for all 550 children, with staff hoping to increase this frequency in the future.

The routine was similar in both schools: pupils left their classrooms at scheduled times carrying their tooth brushes and cups and assembled in height order in a garden (Tan Hiep), or at the tooth brushing area (Ben Cau). A teacher dispensed toothpaste, then the pupils moved to the sinks. Horizontal and vertical scrub tooth brushing was noted, followed by water rinsing. The process took about 4-5 minutes; pupils then returned to their classrooms and resumed classes. They appeared accustomed to the process, participating happily and wholeheartedly, suggesting it was a regular school activity.

## Discussion

The present study continued previous studies of schoolchildren in rural Vietnam conducted in association with RAVDH Project visits in 2007 and 2008. The studies have examined 11-16 year-old children from several schools in Vi Thanh, Ben Cau and Tan Hiep, which had been visited annually by the Project for 5 years, 4 years, and 1 year respectively. Over the three years (2007-2009), 535 children (2007: 142; 2008:193; 2009: 200) completed questionnaires on oral hygiene and diet; of these, 389 (2007: 69; 2008: 120; 2009: 200) were also examined clinically, providing DMFT scores.

Selected oral hygiene practices of the children over the three years are shown (Table 7). Almost all (99-100%)

reported tooth brushing with toothpaste, at least twice per day (76-88%); an increase was seen over the three years in those brushing at least before breakfast and before bed (up from 51% to 69%). Use of a rinse (water, salty water, or commercial mouth rinse), in addition to brushing with toothpaste was more prevalent in 2008 (42% of children) than in 2007 (19%) or 2009 (26%). Use of both toothpicks and a rinse in addition to brushing with toothpaste was more prevalent in 2007 (47%) and 2009 (63%) than in 2008 (18%). Although use of traditional cleaning aids (toothpicks, salty water rinses) was noted in all three studies, an increase in the use of commercial mouth rinses and dental floss was apparent in 2009. In both 2008 and 2009, 76% of children reported being taught how to brush their teeth, and in 2009, for 33% this teaching had been by their school teachers, reflecting the recent implementation by the RAVDH Project of a school-based tooth brushing program in Ben Cau and Tan Hiep. The oral hygiene habits noted in the present studies were much more favourable than those reported in 1999 for 6-17 year-old children in Vietnam, when fewer than 50% reported daily tooth brushing and only 60% used a fluoride toothpaste.[5]

TABLE 6: STATUS OF 134 RESTORATIONS IN 44 CHILDREN IN BEN CAU

| Quality of Restoration | Distribution of Restoration | |
|---|---|---|
| | Placed by RAVDH Project Clinicians (n=114) (Valid %) | Placed by Local Dentists (n=20) (Valid %) |
| Number of children | 33 | 11 |
| Year restoration placed: | | |
| 2007 | 0 | 4 (20) |
| 2008 | 114 (100) | 8 (40) |
| 2009 | 0 | 3 (15) |
| Other | 0 | 5 (25) |
| Restoration status: | | |
| Present | 99 (87) | 18 (90) |
| Partially missing | 6 (5) | 2 (10) |
| Completely missing | 9 (8) | 0 |
| Restored surface: | | |
| Occlusal | 98 (86) | 18 (90) |
| Proximal | 12 (11) | 2 (10) |
| Occlusal and proximal | 4 (3) | 0 |
| Restorative material: | | |
| Glass-ionomer cement | 105 (100) | 9 (45) |
| Resin composite | 0 | 2 (10) |
| Amalgam | 0 | 9 (45) |
| Marginal discolouration:[a] | | |
| Alfa | 95 (83) | 16 (80) |
| Bravo | 18 (16) | 4 (20) |
| Charlie | 1 (1) | 0 |
| Anatomic form:[b] | | |
| Alfa | 85 (75) | 12 (60) |
| Bravo | 14 (13) | 5 (25) |
| Charlie | 15 (13) | 3 (15) |
| Marginal adaptation:[c] | | |
| Alfa | 79 (69) | 11 (55) |
| Bravo | 20 (18) | 5 (25) |
| Charlie | 0 | 2 (10) |
| Delta | 15 (13) | 2 (10) |
| Caries:[d] | | |
| Alfa | 104 (91) | 18 (90) |
| Bravo | 10 (9) | 2 (10) |

(a) Alfa- No discolouration anywhere along the margin between the restoration and the tooth structure; Bravo- Discolouration along the margin between the restoration and the tooth structure, but the discolouration has not penetrated along the margin in a pulpal direction; Charlie- Discolouration along the margin between the restoration and the tooth structure, and the discolouration has penetrated along the margin in a pulpal direction.

(b) Alfa- Restoration is continuous with existing anatomic form; Bravo- Restoration is under-contoured, i.e. there is material missing, but there is no exposed dentine; Charlie- Restoration is under-contoured, i.e. there is material missing, and there is exposed dentine.

(c) Alfa- No visible evidence of a crevice along the margin; Bravo- Visible evidence of a crevice along the margin but there is no exposed dentine; Charlie- Visible evidence of a crevice along the margin and there is exposed dentine, but the restoration is not mobile, fractured or missing (in part or completely); Delta- Visible evidence of a crevice along the margin, there is exposed dentine, and the restoration is mobile, fractured or missing (in part or completely).

(d) Alfa- No evidence of caries contiguous with the margins of the restoration; Bravo- Evidence of caries contiguous with the margins of the restoration.

Oral hygiene aids were widely available in Tan Hiep and Ben Cau. In Tan Hiep, many small stalls along the main road sold tooth brushes and toothpastes. Brand-dependent, toothpastes cost about 12,000 dong (approx. 1 AUD) for a small tube and about 30,000 dong (3 AUD) for a large tube. Shopkeepers cited improved toothpaste sales with recent falling prices. They identified PS™ toothpastes as the most popular for children, confirming findings of the present study. Not using shop inventories, shopkeepers were unable to estimate sales of tooth brushes and toothpastes, but they reported unloading about two mass cartons per month. In addition to the Ben Cau supermarket on the Vietnamese-Cambodian border, which stocked a wide range of tooth brushes, toothpastes and mouth rinses, a few roadside stalls also sold these items. Low mouth rinse sales were reported, due to high cost (approx. 50,000 dong).

Selected findings on the consumption of sweet drinks and sweet foods by the children over the three years are shown (Table 8). Consumption of sweet drinks twice or more per day decreased considerably over the three years (down from 57% to 23% of children), while consumption of sweet foods increased (up from 29% to 64%). The consumption of sweet drinks plus sweet foods three or more times per day was higher in 2009 (consumed by 60% of children) than in 2007 (51%) and 2008 (32%). The mean daily frequency of consumption of sweet foods increased, up from 1.2 (1.0) in 2007 to 2.0 (1.0) in 2009, while mean daily frequency of consumption of sweet drinks plus sweet foods remained high: 2007: 2.9 (1.7); 2008: 2.2 (1.7); 2009: 3.0 (1.8).

Caries was very prevalent, affecting 94-96% of children examined in the three villages over the three years (Table 9). The mean DMFT scores ranged from 4.4 (2.3) for Ben Cau in 2007[1] to 3.8 (2.4) for Ben Cau and Vi Thanh in 2008.[2] In 2007, girls trended towards significantly higher mean caries experience than boys: 5.1 (2.3) vs. 3.6 (2.0), but no gender differences were seen in 2008: 3.7 (3.9) vs. 4.0 (2.8), or in 2009: 4.1 (2.5) vs. 4.2 (2.7). These

TABLE 7: REPORTED ORAL HYGIENE PRACTICES OF 535 CHILDREN AGED 11 - 16 YEARS IN THREE RURAL VILLAGES IN VIETNAM, 2007-2009

| Oral Hygiene Practices | Distribution of Children (n=535) | | |
|---|---|---|---|
| | Ben Cau, 2007 (published 2008[1]) n = 142 (%) | Ben Cau and Vi Thanh, 2008 (published 2009[2]) n = 193 (%) | Ben Cau and Tan Hiep, 2009 (present study) n = 200 (%) |
| Brush teeth with tooth brush and toothpaste | 141 (99) | 193 (100) | 200 (100) |
| Brush ≥ 2 per day | 109 (77) | 170 (88) | 200 (76) |
| Brush both before breakfast + before bed | 73 (51) | 112 (58) | 139 (69) |
| Use tooth brush + toothpaste + rinse[(a)] | 27 (19) | 82 (42) | 53 (26) |
| Use tooth brush + toothpaste + rinse[(a)] + toothpicks | 67 (47) | 34 (18) | 127 (63) |
| Taught to brush teeth:<br>Yes<br>No | na[(b)] | 147 (76)<br>46 (24) | 152 (76)<br>48 (24) |

(a) Rinses: water, salty water or commercial mouth rinses
(b) Question not included on questionnaire in 2007

TABLE 8: CONSUMPTION OF SWEET DRINKS AND SWEET FOODS BY 389 CHILDREN AGED 11-16 YEARS IN THREE RURAL VILLAGES IN VIETNAM, 2007-2009

| Consumption of Sweet Drinks and Sweet Foods | Distribution of Children (n=389) | | |
|---|---|---|---|
| | Ben Cau, 2007 (published 2008[1]) n = 69 (%) | Ben Cau and Vi Thanh, 2008 (published 2009[2]) n = 120 (%) | Ben Cau and Tan Hiep, 2009 (present study) n = 200 (%) |
| Consume sweet drinks:<br>≥ 2 times per day<br>Mean (± SD) frequency | 39 (57)<br>1.7 (1.2) | 26 (22)<br>0.9 (1.1) | 46 (23)<br>1.3 (0.9) |
| Consume sweet foods:<br>≥ 2 times per day<br>Mean (± SD) frequency | 20 (29)<br>1.2 (1.0) | 37 (31)<br>1.3 (0.9) | 127 (64)<br>2.0 (1.0) |
| Consume sweet drinks plus sweet foods:<br>≥ 3 times per day<br>Mean (± SD) frequency | 35 (51)<br>2.9 (1.7) | 39 (32)<br>2.2 (1.7) | 120 (60)<br>3.0 (1.8) |

TABLE 9: CARIES EXPERIENCE AND CONSUMPTION OF SWEET DRINKS AND SWEET FOODS BY 389 CHILDREN AGED 11 - 16 YEARS IN THREE RURAL VILLAGES IN VIETNAM, 2007-2009

| Distribution of children and consumption of sweet drinks and sweet foods | Caries experience as mean (± SD) DMFT | | |
|---|---|---|---|
| | Ben Cau, 2007 (published 2008[1]) n = 69 (%) | Ben Cau and Vi Thanh, 2008 (published 2009[2]) n = 120 (%) | Ben Cau and Tan Hiep, 2009 (present study) n = 200 (%) |
| Girls<br>Boys<br>Total | 5.1 (2.3)<br>3.6 (2.0)<br>4.4 (2.3) | 3.7 (3.9)<br>4.0 (2.8)<br>3.8 (2.4) | 4.1 (2.5)<br>4.2 (2.7)<br>4.1 (2.6) |
| Consume sweet drinks:<br>2 times per day<br>≥ 3 times per day | 4.5 (2.8) (n = 28)<br>4.7 (0.8) (n = 11) | 4.7 (1.9) (n = 19)<br>9.3 (2.7) (n = 7) | 3.4 (2.4) (n = 32)<br>5.7 (2.4) (n = 14) |
| Consume sweet foods:<br>2 times per day<br>≥ 3 times per day | 4.1 (1.9) (n = 14)<br>4.5 (2.0) (n = 6) | 4.3 (3.0) (n = 26)<br>5.4 (2.9) (n = 11) | 4.2 (2.8) (n = 77)<br>4.5 (2.6) (n = 50) |
| Consume sweet drinks plus sweet foods:<br>3-4 times per day<br>5-10 times per day | 4.6 (2.6) ( n= 24)<br>4.3 (1.7) (n = 11) | 4.9 (2.2) (n = 28)<br>7.4 (3.3) (n = 11) | 3.8 (2.7) (n = 88)<br>5.3 (2.6) (n = 32) |

DMFT scores were higher than the average DMFT scores for permanent teeth of 6-17 year-olds in Vietnam (2.5 ± 4.4) reported in 1999.[5]

The trend towards increasing caries experience with more frequent consumption of sweet drinks noted in 2007 and 2008 continued in 2009. Selected findings on dietary sugar consumption and caries experience over the three years are shown (Table 9). Despite small subgroup sample sizes, consistent trends were seen between increasing caries experience and increasing frequency of consumption of sweet drinks and sweet foods. The mean DMFT scores were consistently higher when sweet drinks were consumed three or more times per day in comparison with twice per day: 2007: 4.7 (0.8) vs. 4.5 (2.8); 2008: 9.3 (2.7) vs. 4.7 (1.9); 2009: 5.7 (2.4) vs. 3.4 (2.4), and when sweet foods were consumed three or more times per day in comparison with twice per day: 2007: 4.5 (2.0) vs. 4.1 (1.9); 2008: 5.4 (2.9) vs. 4.3 (3.0); 2009: 4.5 (2.6) vs. 4.2 (2.8). Combining daily intakes of sweet drinks and sweet foods, the mean DMFT scores for those consuming these dietary sugars five to ten times per day were greater than when they were consumed three to four times per day in 2008: 7.4 (3.3) vs 4.9 (2.2), and 2009: 5.3 (2.6) vs. 3.8 (2.7), but the trend was not apparent in 2007: 4.3 (1.7) vs. 4.6 (2.6).

As Vietnam becomes more westernised and industrialised, there is an increasing supply of refined sweet foods, many aimed at consumption by children. Even in rural villages, there was an abundant supply of inexpensive hard and sticky candies, cakes, sweet desserts, soft drinks, sweetened juices and coffees. Some shopkeepers noted escalating sales of sweet, fizzy high 'energy' (caffeine) drinks, especially to children. On the main street of Tan Hiep, numerous stalls sold sweet snacks, and one primary school canteen in Ben Cau stocked a wide variety of sweet treats for children to purchase during recesses. Although health classes were part of the school curricula, giving information and advice to the children on diet and dental care, an increased

emphasis appears necessary on moderating intake of sweet products, as the children seemed unconcerned about diets high in processed sugars and unaware of the correlation with dental decay.

The study included examination of 114 glass-ionomer cement restorations placed in children in Ben Cau by the Project team in 2008. At this 12 month recall, 87% of the single surface restorations were deemed fully satisfactory; this is comparable to other studies reporting 85%, 86.4% and 91% retention at one year for Class I restorations placed using the ART approach in developing countries including Cambodia and China.[6-9] While the overall quality of the restorations placed by the local dentists did not appear as high as those placed by the Project team, it must be noted that only 20 restorations were examined, these had been placed under less than optimal clinical conditions (eg. lack of suction), and some had been in place for over 12 months.

At Tan Hiep General Hospital, the dental equipment furnished by the RAVDH Project was observed in use by the local dental staff – one dentist and one dental nurse with responsibilities of a dental therapist. The Project donation has allowed expansion of the dental clinic with modern dental units suitable for restorative procedures. At the time of the visit the suction equipment was malfunctioning. The dental clinic at the Ben Cau District Health Centre had one manual dental chair with a portable dental unit (without suction), and one electric dental chair with attached dental unit but no functioning suction equipment. Treatment provided was primarily extractions; restorations were provided occasionally. Fees appeared to be a determining factor; an extraction cost approximately 40,000VND whereas a restoration cost 2-3 times this amount and endodontic therapy cost approximately 5 times this amount. The clinic in Ben Cau was staffed by one dentist, who also maintained a private practice, serving as the main dental care provider for the village population of approximately 60,000.

Equipment and materials donated by previous RAVDH Project teams were much appreciated, assisting local dentists to provide much-needed dental care. Local staff showed great interest in the dental materials brought by the Project team, asking many questions about composition, method of use, indications and contraindications; the information was received with much gratitude and enthusiasm. Local dentists at both locations were very grateful for the Project visits, particularly appreciating the donated equipment, materials and support, and the team's contribution to increased productivity.

In both Ben Cau and Tan Hiep, the Project team was met with genuine enthusiasm, warmth and appreciation. The visits appear to be a great source of support and assistance to these remote communities where dental care is not a high priority and oral health is poor. The importance of dental care is not overlooked, rather overshadowed by people trying to make a living to support their families. Having heard the Project team was 'in town', parents would stop team members in the street and ask how their children could receive treatment; they were very disappointed to hear that only children from selected schools were eligible due to sponsor affiliations. Given the cost involved in sending children to school, many young children cannot receive dental care and the prospect of free treatment would have eased the financial burden for some parents who probably neglected their own care to provide for their children.

## Conclusions

Despite improvements in reported oral hygiene habits, the caries experience of schoolchildren in three rural villages studied in Vietnam remains very high and unabated over the three years studied (2007-2009). The intake of dietary sugars, in the form of sweet drinks and sweet foods, which appear to becoming more widely available, is very high. These studies highlight the urgency for professional dental care, preventive measures including moderation of intake of dietary sugars, and oral health education among these Vietnamese children and their families.

## Acknowledgements

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## For Further Information

For further information on the Rotary Australia Vietnam Dental Health Project, readers are encouraged to contact Dr James Robertson, at jamie@robdent.com.au

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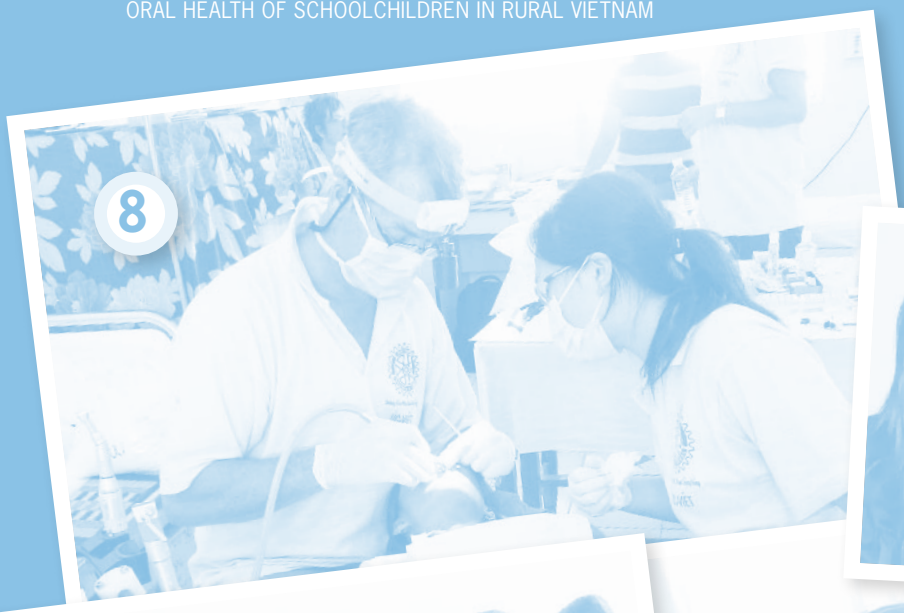













1: Tiffany Van

2: Tiffany Van treating schoolchildren in Tan Hiep

3: Dental Clinic at Tan Hiep General Hospital, including donated chairs from the Rotary Australia-Vietnam Dental Health Project.

4: Temporary Triage Tables used at Tan Hiep General Hospital during RAVDHP 2009.

5&6: Toothbrushing Facilities at Thuan B Primary School, Ben Cau, Vietnam.

7: Children carrying out daily toothbrushing at Thuan B Primary School, Ben Cau, Vietnam.

8&9: RAVDHP 2009 Senior Dentists treating schoolchildren
(8) Dr. David Grant (Ben Cau)
(9) Dr. Malcolm McLean (Tan Hiep)

10: Dental Clinic set-up at Ben Cau Hospital with RAVDHP 2009 Clinicians at work.

# EAPD 2010 – 10th Congress

## 3rd – 6th June, 2010

## Harrogate, North Yorkshire, UK

You are now able to register for the above event by visiting the conference website: www.eapd-2010.org.uk

Please take advantange of the Early Bird Deadline which closes on 26th March, 2010.

The abstract form is now available and the deadline is Monday 1st February, 2010 and authors acceptance letters will be sent out in early March, 2010

Please keep checking the conference website for upto date information on this exciting event.

www.eapd-2010.org.uk

# The ANZSPD Grant

At the Federal Council meeting in Perth in March 2009, it was decided to institute the ANZSPD Grant. The plan is to provide one grant per year to the value of AU$2,000 with all full members of ANZSPD eligible to be considered.

The Grant is available for:

- an oral health initiative in Australia or New Zealand which may be an educational resource or a broad community initiative
- a community research project directly related to child oral health
- support for an oral health project in Asia, Oceania or the Pacific which might be for materials, instruments, books for a school, etc.

Applications are now being called for the inaugural Grant. Applications should be submitted electronically to the Federal Secretary-Manager by 31st July 2010 at devlins@iinet.net.au

Federal Council will then adjudicate. The successful recipient will be required to provide a report to the Federal Council by the end of 2011. The Federal Council may choose not to award a Grant in the event of there being no suitable applications.

# Paediatric Hypnosis Course

# Are you interested?

## As a paediatrician at Taranaki District Health Board, I am planning to organize two workshops on Paediatrics Self-Hypnosis in November 2010 by Dr Laurence Sugarman and Dr Ran Anbar, based on the ASCH curriculum (The American Society of Clinical Hypnosis is the largest U.S. organization for health and mental health care professionals using clinical hypnosis).

Laurence Irwin Sugarman is a developmental and behavioural paediatrician at the Easter Seals Diagnostic and Treatment Centre in Rochester, New York and Clinical Associate Professor in Paediatrics at the University of Rochester School of Medicine and Dentistry.

Ran D. Anbar, MD is a Professor of Paediatrics and Medicine at the SUNY Upstate Medical University in Syracuse, NY. He has served as Director of the Robert C. Schwartz Cystic Fibrosis (CF) Centre in Syracuse for the past 15 years.

Both Dr. Sugarman and Dr. Anbar are well known in the USA. Between the two they have over 20 years of experience in paediatric hypnosis.

Both speakers came to Nelson, New Zealand, in 2006, and gave a well received course on Self-hypnosis for Beginners. This course was intense and limited to 24 participants (among the list were play therapists, paediatric dentists, paediatricians, emergency room physicians, psychiatrist, and psychologists from both New Zealand and Australia).

Some comments from the 2006 course were:

> ***"This was the best course I have attended! I had no previous experience in medical hypnosis, and learnt such a lot over the three days. Breaking up regularly in small groups to actually use our newfound hypnosis skills on each other was a highlight, which meant I left the course with a skill I could really use, as well as feeling quite relaxed!" Dorothy Boyd, Paediatric Dentist***

Over the past three years, I have seen an increased demand for this useful modality across the health sectors (primary care, urgent care, dentistry, mental health), and an interest for another beginner course as well an intermediate one.

Both speakers are keen on coming to New Plymouth, New Zealand, to do two consecutive workshops right after the Paediatric Society of New Zealand (PSNZ) Annual Scientific meeting. For those courses to be practical, they are limited to 24 attendees for the beginner course and eight for the intermediate one. Each course will last three days and include several "hands-on" sessions. The aim is to target health care professionals crossing all fields of Paediatrics many of whom frequently contact me inquiring about the "next course". Consequently, this leads to a rather high cost for each participant which may be prohibitive to most allied health professionals.

The PSNZ sponsored Dr Sugarman and Dr Anbar as key-note speakers in 2006. The Society will not sponsor the workshops in 2010.

Depending on the availability of funding, these courses will occur either at the same site of the PSNZ meeting (yet to be finalized), or at our Educational Centre at Base Hospital.

Please feel free to contact me at daniele.lonchamp@tdhb.org.nz for further information in regards to those workshops. I would be grateful if you also contacted me to advise if you are interested in participating in the course.

Daniele Longchamp
Paediatrician
Taranaki Distric Health Board
New Zealand

# Colgate Corner

**by Dr Barbara Shearer**
Scientific Affairs Manager

barbara_shearer@colpal.com

## 16th Biennial Convention of the Australian and New Zealand Society of Paediatric Dentistry

**28-30 March 2010, Queenstown**

The ANZSPD conference is fast approaching and I am sure that the organizing committee is extremely busy working to ensure a wonderful meeting for us all, both in terms of scientific and social programs.

Colgate will again act as the Principal sponsor.

I hope that many of you will be able to attend and take advantage of the great location and educational opportunities. The Colgate team in NZ is looking forward to welcoming you and demonstrating our product range.

## Global Child Dental Health Taskforce

At the last meeting of the Global Child Dental Health Taskforce we took time to review the progress we have made since the taskforce began in 2006.

More than 250 000 toothbrushes and tubes of toothpaste have been distributed to the states, territories and NZ for use in evidence-based oral health programs targeted to the children most at risk of dental caries. In addition thirty smaller projects have been supported with brushes and paste, both within Australia and NZ, and our near neighbours.

Members of the taskforce have been asked to act in an advisory role for other taskforces with less expertise and experience.

Over the past three years, Colgate has supported three delegates to the Senior Dental Leaders course in London.

2007 – Angus Cameron

2008 – Callum Durward

2009 – Julie Satur

For 2010, the taskforce selected Clare Phelan from the NSW Centre for Oral Health Strategy to represent the ANZ region at the Senior Dental Leaders program which will be held in Boston, March 7-12. Colgate is pleased to cover the US$10,000 course fee and accommodation costs each year.

We are also planning a symposium at the next taskforce meeting in May, where we will invite representatives from each state and territory to report on the projects they have undertaken with the taskforce resources.

I would like to thank all of the taskforce members for their enthusiasm and participation in making this project a success.

# Coming events

28th March 2010
Australasian Academy of Paediatric Dentistry Biennial Meeting
Skyline and Gondola
Queenstown, New Zealand

28th – 30th March 2010
16th Biennial Congress of ANZSPD
Queenstown, New Zealand

27th – 31st May 2010
63rd AAPD Annual Session
Chicago, Ill

3rd – 6th June, 2010
10th Congress EAPD
Harrogate, North Yorkshire, UK

11th – 13th June 2010
16th World Congress Dental Traumatology
Verona, Italy

14th – 17th July 2010
IADR General Session and Exhibition
Barcelona, Spain

26th – 29th May 2011
64th AAPD Annual Session
New York, N.Y.

24th – 27th May, 2012
65th AAPD Annual Session
San Diego, California


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## Deadline next issue Friday, 21 May 2010